



Attempt all questions before checking the answer key. Assume fair dice/coins and equally likely selections unless stated. A' denotes the complement of A .

A. Very short answers - 1 mark each

1. State the range of values of the probability of an event.
2. If $P(A) = 0.37$, find $P(A')$.
3. What is meant by mutually exclusive events?
4. Can mutually exclusive events both occur in the same trial?
5. State $P(A \cup B)$ for any two events A and B .

B. Short answers / practice - 2 marks each

6. A fair die is thrown. Find the probability of an even number or a number greater than 4.
7. A card is drawn from a standard 52-card deck. Find the probability of a king or a queen.
8. If $P(A) = 0.5$, $P(B) = 0.4$ and $P(A \cap B) = 0.2$, find $P(A \cup B)$.
9. A bag contains 5 red and 3 blue balls. Find the probability that one ball drawn is not red.
10. Give an example of two events that are exhaustive but not mutually exclusive.
11. Find probability of a prime number on a fair die.
12. Find probability of two heads in two fair tosses.
13. Can an event have probability 1.2?
14. Find probability of a red card in a standard deck.
15. If $P(A) = 0.8$, find $P(\text{not } A)$.
16. A bag has 2 white and 5 black balls. Find $P(\text{white})$.
17. Find probability of sum 12 on two fair dice.
18. Are getting 1 and getting 6 on one die mutually exclusive?
19. Find probability of at most one head in two tosses.

20. For disjoint A, B with probabilities 0.2, 0.3, find $P(A \cup B)$.

C. Short answers - 3 marks each

21. Two fair dice are thrown. Find the probability that the sum is 8 or both numbers are equal.

22. Three fair coins are tossed. Find probabilities of exactly two heads and at least one head by counting outcomes.

23. A number is chosen uniformly from 1 to 30. Find the probability that it is divisible by 3 or 5, but not both.

24. If $P(A \cup B) = 0.8$, $P(A) = 0.5$ and $P(B) = 0.6$, find $P(A \cap B)$, $P(A - B)$ and $P(B - A)$.

25. Two cards are chosen together from a standard deck. Find the probability that both are aces and that exactly one is an ace, using combinations.

D. Long answers - 5 marks each

26. Prove $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ by splitting into disjoint parts. Deduce the special case for mutually exclusive events.

27. A die is rolled once. Let A be an even outcome, B an outcome greater than 3 and C a prime outcome. Find probabilities of $A \cup B$, $A \cap C$, $B - A$, and the complement of $A \cup B$, with set reasoning.

28. From 5 red and 4 blue balls, 3 are chosen together. Find probabilities of all red, exactly two red and at least one blue. Verify complementary probabilities where appropriate.

29. Two fair dice are thrown. Let A be sum 7 and B be at least one 6. Find $P(A)$, $P(B)$, $P(A \cap B)$ and $P(A \cup B)$; decide whether A and B are mutually exclusive.

30. Events A and B have $P(A) = 0.6$ and $P(B) = 0.7$. Determine the possible range of $P(A \cap B)$, explain both bounds and decide whether the events can be mutually exclusive or exhaustive.

ANSWER KEY - Numerical / short answers

- 1) $[0, 1]$. 2) 0.63. 4) No. 6) $2/3$. 7) $2/13$. 8) 0.7.
9) $3/8$. 11) $1/2$. 12) $1/4$. 13) No. 14) $1/2$. 15) 0.2.
16) $2/7$. 17) $1/36$. 18) Yes. 19) $3/4$. 20) 0.5. 21) $5/18$. 22) $3/8$; $7/8$. 23) $2/5$. 24) 0.3; 0.2; 0.3. 25) Both aces $1/221$; exactly one $32/221$. 27) $2/3$; $1/6$; $1/6$; $1/3$. 28) $5/42$; $10/21$; $37/42$. 29) $1/6$; $11/36$; $1/18$; $13/36$; not mutually exclusive. 30) $0.3 \leq P(A \cap B) \leq 0.6$; cannot be mutually exclusive; can be exhaustive if intersection = 0.3.